REMARKS

Upon entry of the present amendment, Amendment-A, claims 1-20 will be pending in the present application, of which claims 1, 3-6 and 15 are independent. New claims 14-20 have been added to further define additional aspects of the invention.

The above-identified Office Action has been reviewed, the applied references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment-A is submitted. It is contended that by the present amendment, all bases of rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

Amendments

In the above amendments: claim 1 has been amended to further and more particularly define the subject matter which applicant regards as the present invention. Particularly, claim 1 has been amended herein to further define that a distribution of flow speed on the extrados has a supersonic region of a substantially constant flow speed after a region that is decreased steeply from a first large value of the flow speed, said supersonic region of a substantially constant flow speed being inside a position corresponding to 15% of a chord length from a leading edge of the blade, and said supersonic region of a substantially constant flow speed being followed by a steeply decreased region.

Claim 2 has been amended to correct antecedent basis.

Claim 3 has been amended herein to further define that a variation in curvature behind the first small value of curvature towards a trailing edge is set such that a distribution of flow speed on the extrados has a first large value just behind the leading edge, that is followed by a region which is decreased steeply from the first large value, said region being followed by a

supersonic region of a substantially constant flow speed, said supersonic region of a substantially constant flow speed followed by another steeply decreased region, said supersonic region of a substantially constant flow speed being inside a position corresponding to 15% of a chord length from the leading edge of the blade.

Claims 4-6, having allowable subject matter as indicated by the Examiner in the Office Action, have been rewritten in independent form to include all the limitations of the base claim and intervening claims. Therefore, the amended claims 4-6 are believed to be in allowable form.

Claims 7-12 have been amended to overcome informalities.

Specification (paragraphs [009], [013], [014], [032], [033] and [035]) has been amended to overcome informalities.

New dependent claim 14 defines further aspects of claim 1. New independent claim 15 is similar to claim 1, except that a curvature of the extrados varies from a leading edge to a trailing edge of the blade. New dependent claims 16-20 define further aspects of claim 7.

Applicant respectfully submits that the above amendments are fully supported by the original disclosure including drawings, and that no new matter is introduced into the application by the above amendments. Accordingly, it is respectfully requested that the rejections be reconsidered and withdrawn.

Applicant further respectfully submits that new claims 14-20 are fully supported by the original disclosure including drawings (specifically Fig. 3, and the discussion thereof), and that no new matter is introduced into the application by these new claims.

Claim Rejections

In the Office Action, the Examiner provides a brief rejection of claims 1-3 and 7-13 under 35 USC §102(b) as allegedly anticipated by Katoh et al. (US 5,554,000).

In his rejection, the Examiner states that Katoh et al. disclose a transonic blade for use in a blade cascade of an axial flow compressor including a large number of blades 4 disposed in an annular fluid passage, and each blade having an intrados and an extrados. Also, the Examiner states that Katoh et al. disclose a Mach number of main flow being between 0.8 and 1.1.

Further, the Examiner states that the language used in the "wherein" statements of claims 1-3 and 10-13 is functional language, and there appears to be no structural difference between the claimed invention and the system of Katoh et al., and that the aerofoil of Katoh et al. would inherently be capable of performing claimed functions.

Applicant's Response:

Upon careful consideration and in light of the above amendments, applicant respectfully submits that the rejection is overcome, and each of claims 1-3 and 7-13 is patentably distinct over the disclosure of Katoh et al. for several reasons, including those given below.

For example, Katoh et al. disclose an axial flow compressor having plurality of axial compressor blades (both stator and rotor blades 3, 4) which exhibit high performance and low pressure loss when inlet flow is in a higher subsonic region or in a transonic range. Katoh et al. further disclose that a curvature distribution on the suction surface of each of these stator blade rows and/or the rotor blade rows is changed, and the change in this curvature distribution on suction surface is arranged to have a local minimum 3b to be followed by a local maximum 3c in the direction from its leading edge (blade surface position "0") to its trailing edge (blade surface position "1") (col. 1, lines 48-60 and col. 4, lines 12-25).

Further, Katoh et al. disclose that a curvature distribution on the suction surface of each of the stator blade rows and/or the rotor blade rows has a local minimum 3b located on a particular point, on the blade surface, between a position where a Mach number becomes 1 and a

position where a maximum velocity is indicated (col. 4, lines 20-25).

Still further, Katoh et al. disclose that a curvature distribution on the suction surface of each of the stator blade rows and/or the rotor blade rows is arranged to have a local minimum 3b in a region which corresponds to a region on the suction surface where a maximum velocity is indicated.

Katoh et al., moreover, assert that when the stator blade or rotor blade of any axial flow compressor is adapted to have the aforementioned blade profile (again however, the disclosure relates to blade row profile) having the local minimum and local maximum, an occurrence of a shock wave can be avoided since a smooth deceleration from a supersonic region taking place on the suction surface can be attained. Therefore, pressure loss in the blade rows can be minimized, consequently improving the total efficiency of the axial flow compressor substantially.

Thus, the disclosure of Katoh et al. relates to the curvature distribution of stator/rotor blade rows. However, Katoh et al. fail to disclose curvature distribution from leading edge to trailing edge on extrados for each high-turning and high-transonic blade, as claimed. It may be noted that, in the disclosure of Katoh et al., a curvature of distribution is associated with a blade surface position, which according to Figs. 1, 3, 4 and 6 corresponds to a section of stator/rotor blade rows taken along a plane. Whereas, in the claimed invention a distribution of curvature on extrados is associated with an individual blade of the axial flow compressor, and curvature distribution is defined along the chord-wise length of each blade. The chord-wise length extends from a leading edge having a chord-wise length of 0, to a trailing edge having a chord-wise length of 1.

Further, Katoh et al. disclose that where a fluid having a high subsonic velocity is allowed to hit the leading edge of the blade while attaining velocity exceeding the sonic velocity

on the suction surface, the velocity of the fluid to be ejected can be reduced to a subsonic velocity without the occurrence of shock wave, thereby attaining a substantial decrease in pressure loss (col. 4, line 36 – col. 5, line 50). As will be understood, this teaches away from the claimed invention, in which, for each blade having an appropriate curvature distribution, a first strong shock wave is induced at the leading edge to generate a pressure loss in a main flow, and a second weak shock wave is induced behind the first shock wave to reduce a pressure loss in a following flow on the blade, whereby total pressure loss due to the first and second shock waves is reduced.

Additionally, Katoh et al. fails to teach or suggest a turning angle and its magnitude, as required by claims 7-9.

Further, although Katoh et al. disclose a Mach number distribution curve in their Fig. 9 representing the Mach number 1.1 or less, this does not correspond to the feature of claims 10-12, nor does it relate to applicant's discovery that in a higher subsonic region where the inlet Mach number is 0.8 or more, the occurrence of the shock waves is avoided and a substantial decrease in pressure loss has been attained in comparison with large pressure loss associated with the prior art blade. Thus, Katoh et al. fail to disclose the Mach number between 0.825 and 1.0 for reducing total pressure loss, as required by claims 10-12.

For all of the foregoing reasons, applicant requests consideration and withdrawal of the rejection of claims 1-3 and 7-13 under 35 USC § 102(b).

Allowable Subject Matter

In the above-identified Office Action, the Examiner objected to claims 4-6 as being dependent upon a rejected base claim, but indicated that these claims would be allowable if rewritten in independent form including all of the limitations of the base claims and any

intervening claims. Applicant gratefully acknowledges the Examiner's indication of allowability. Claims 4-6 have been rewritten in independent form including limitations of the base claims and intervening claims. Thus, claims 4-6 are believed to be in allowable form.

Conclusion

In conclusion, applicant has overcome the Examiner's rejections as presented in the Office Action; and moreover, applicant has considered all of the references of record, and it is respectfully submitted that the invention as defined by each of present claims 1-20 is patentably distinct thereover. Further, applicant respectfully suggests that new claims 3-8 are patentably distinct over the disclosure of Katoh et al.

Applicant respectfully submits that all of the above amendments and new claims are fully supported by the original application. Applicant also respectfully submits that the above amendments and new claims do not introduce any new matter into the application.

The application is now believed to be in condition for allowance, and a notice to this effect is earnestly solicited.

If any issues remain unresolved, applicant respectfully requests that the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application.

The Commissioner is hereby authorized to charge $600.00 for three independent claims in excess of three, as well as to charge any deficiency which may be required during the entire pendency of the application, and to credit any excess paid during the entire pendency of the application, to Deposit Account 50-0744 in the name of Carrier, Blackman & Associates, P.C.

A duplicate copy of this sheet is enclosed.

Favorable consideration is respectfully requested.

Respectfully submitted,

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9 December 2005

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CERTIFICATE OF FACSIMILE TRANSMISSION

I hereby certify that this correspondence is being transmitted via facsimile to the US Patent & Trademark Office, Art Unit 3745, on 9 December 2005, at the number (571) 273-8300.

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